Pupil clustering in English secondary schools: One pattern or several?

Stephen Gorard and Shou Chen Cheng
The School of Education
University of Birmingham
s.gorard@bham.ac.uk

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Abstract

Previous international work has shown that clustering pupils with similar characteristics in particular schools yields no clear academic benefit, and can be disadvantageous both socially and personally. Understanding how and why this clustering happens, and how it may be reduced, is therefore important for policy. Yet previous work has tended to focus on only one kind of clustering at a time. In the USA, for example, black:white segregation of pupils has been the key issue. In the UK, and across Europe, the focus has been on social background, especially on the segregation of pupils living in poverty. With access to high quality national datasets in England, it is now possible to track the between-school segregation of numerous pupil characteristics over a 15 year period. This paper uses school level figures for all state-funded secondary school pupils in England from 1996 to 2009, including free school meals, special needs, ethnicity and first language. The paper investigates, more fully than has been attempted before, whether segregation in terms of these indicators has a common pattern. It presents evidence for the existence of at least three different processes of between school segregation over this period, and proposes one possible determinant for each, and some future work that could be done to clarify the situation. The paper therefore provides an important corrective to previous work that sought explanation for only one type of segregation. In the allocation of school places, pupils are being clustered in several distinct ways. The standard previous explanations for pupil clustering such as selection by ability or housing, faith-based enrolment, and increased parental choice, apply only to *some* of these forms of segregation.

Patterns of pupils clustering

This paper uses school-level figures for all state-funded secondary schools in England 1996 to 2009 to investigate whether the pattern of between-school segregation for any one pupil characteristic, like living in poverty, is the same as for any other, including special needs, ethnic origin, and first language. The paper starts by considering some of what is already known about pupil segregation between schools and why this phenomenon is important, before outlining the methods used in this new study. Ensuing sections look at segregation patterns over time and across institutions, and the paper concludes by reprising three possible different patterns of segregation, and

some of their potential determinants, and suggests ways forward for research in this area. The results are significant because segregation, whether black:white in the USA or by poverty in the UK, is usually investigated as a single process. But the existence of at least three separate patterns suggests more than one process by which similar pupils are clustered in schools, and therefore more than one causal model involved. Why does this matter?

There is very little good evidence internationally that having pupils with similar characteristics clustered in the same schools produces any improvement in overall levels of attainment, rather there are indications of the reverse (Gorard 2006, Alegre and Ferrer 2010). For example, pupils in selective schools (or tracks) may gain higher levels of examination attainment than those in non-selective systems, but the system as a whole is no better than zero sum. There may be a minority of pupils in any system that have severe learning or physical difficulties who require specialist help and facilities. But the numbers are relatively small, and it is not clear that such facilities have to be provided in separate special schools anyway, as opposed to being nested within mainstream settings. There is stronger evidence, however, that clustering pupils with similar characteristics could have deleterious effects on social justice by reducing further the aspirations, post-compulsory participation, citizenship activities, and sense of justice for some disadvantaged pupils (Gorard and Smith 2010). But even if it were true that the school mix, or distribution of the characteristics of the pupil intake, somehow assisted their learning this would simply reinforce a key point for this paper. The clustering, or segregation, of similar pupils between schools is an important phenomenon. It is something that policy-makers should be aware of when planning changes to the system of allocating school places, and something that social scientists need to understand if they are to offer evidence-based advice on how to deal with it.

Yet previous work has tended to focus on only one kind of clustering with one borad determinant. For example, in the Netherlands tracking by ability and academic/vocational choices has been identified as the key determinant of stratification by family background (Kloosterman and de Graaf 2010, Tieben and Wolbers 2010). Early work in the UK concerned the segregation of pupils by poverty (Gorard 1997), and this tradition has continued ever since (Coldron et al. 2010), even where researchers use alternative and proxy variables to look at the same issue (Gibson and Asthana 1999, Croxford and Paterson 2006). Gorard et al. (2003) did look at figures for other pupil characteristics such as special educational need, first language and ethnic origin. But the government had only recently started collecting these figures at that stage (first language was only part of the annual school census in England from 2000 onward, for example). Also, Gorard et al. (2003) only looked at each indicator in isolation, and segregation of all four had been decreasing annually so it seemed as though one process could account for all four trajectories.

In the UK, segregation by poverty has been considered an outcome of the regional stratification of economic activity, housing prices and social housing policies, increased diversity of schools (Exley 2009), and the process of school place allocation. A key element of school place allocation is the order in which schools or local authorities apply over-subscription criteria to parental choices. Some commentators have argued that increased segregation is an inevitable outcome of parental choice, and some have argued the opposite, or even that the problem lies in

the ability of schools to turn away applicants once a planned admission number is reached. When schools are over-subscribed they might use selection by ability or aptitude, proximity of residence, evidence of relevant faith, special educational need, or even a lottery, to decide on places. There is also evidence that changes in the overall number of schools, and changes in the prevalence of poverty, are related to the precise level of local segregation. In the limited sense that other kinds of segregation have been considered in the UK it has been assumed that the same kinds of reasons apply to these also. But is this true? Is there one process, perhaps involving a number of these factors, that clusters similar pupils together in schools however their similarity is measured? Or do these factors operate differently, or perhaps not operate at all, in separate processes of segregation depending on which pupil characteristics are considered?

The paper investigates, more fully than has been attempted before, whether segregation in terms of these indicators has a common pattern. The paper therefore provides an important corrective to previous work that sought explanation for only one type of segregation. How did we go about this?

The study and measurement of pupil segregation between schools in the UK has made considerable advances since a brief research note by Gorard (1997) proposed the routine use of the annual schools census (ASC) data, and developed a strongly compositional invariant index of segregation and a 'segregation ratio'. For example, the Department of Education (previously DCSF) in England now routinely conducts an annual analysis using measures from ASC and an index like the one proposed. A lot of attention has focussed, like Gorard (1997), on the clustering of pupils living in families below the poverty line. This is partly because of the data available on take-up and then eligibility for free school meals (FSM) via ASC since 1989 (West and Ylonen 2010). FSM is a useful, but limited, indicator of household poverty (Gorard et al. 2003). It is more robust than data on the Certified National School Lunch Program in the USA (Harwell and Lebeau 2010), but suffers from many of the same defects (Hobbs and Vignoles 2010). For example, data is missing or invalid for around 10% of pupils (Gorard 2010a). Nevertheless it is the most complete, simplest (binary) and easiest to define measure of poverty currently available to analysts. And the results of Gorard et al. (2003) are now widely accepted as a true picture for segregation by FSM (Croxford and Patterson 2006, Allen and Vignoles 2007) - '…it is now reasonably well established that social segregation has not significantly increased nationally since the introduction of a quasi market in education' (Coldron et al. 2010, p.21). In England, the highest recorded level of segregation was in 1989 (when records began), it fell after 1990 reaching a low plateau in 1995 before rising annually from 1997. There are recent indications that segregation is falling again (Cheng and Gorard 2010).

Subsequently, since at least 1996, schools have also reported how many pupils have special educational needs. Since 1997, schools have given an ethnic origin breakdown of their intakes, and since 2000 have reported the first (or home) language of all pupils. As with FSM, these variables have limitations but are almost certainly the best figures available (Salway et al. 2010). The questions addressed in this paper are:

> What are the trends in segregation between secondary schools in England, for all available indicators of potential pupil disadvantage?

Do the trends for each indicator represent part of an overall pattern, or are there several different types of pupil segregation?

What can we begin to say about the causes of each distinct form of segregation?

Methods

The analysis presented here to address these questions is based on figures from the Annual Schools Census (ASC) for all maintained secondary and middle-deemed-secondary schools, plus Academies and City Technology Colleges, in England from 1996 to 2009. We used school level figures for the number of full-time equivalent pupils on roll in each school for January of each year, the number eligible for and taking free school meals (FSM), those with a declared additional or special educational need with or without a statement (SEN), in each minority ethnic group, and speaking a first language other than English. These are all indicators of possible educational disadvantage, based on poverty, or challenges to learning via English in an English setting.

Pupils with a learning difficulty have special educational needs, and they may have a disability hinders their progress at school and/or have greater difficulty in learning than most children in their age group. The 2001 SEN and Disability Act clarified that all pupils with SEN without a statement of need must be educated in mainstream schools, and pupils with a statement must also be educated in mainstream unless the parents wish otherwise or this inclusion is incompatible with the proper education of other pupils. A statement is given where a statutory assessment is made of the individual need and the number of hours support as envisaged by the Education Act 1996. The number of children with statements varies with local authority policy, but a statement is usually given when a child cannot be supported within the resources normally available to the school. So the child is either educated elsewhere or additional resources are provided in a mainstream setting. Parents can appeal where a statement is not given. The Education Act 1996 clarifies that simply speaking a language other than English at home is not considered a special educational need in this sense.

In order to help preserve anonymity where the number of cases is small, the Annual Schools Census records '#' in all cells where the true value is 1 or 2. In all cases we have replaced these with 1.5, being the average value as we can have no idea whether the true value is 1 or 2. The decision makes no difference to the substantive findings presented here. The Census also records a secondary suppressed cell, using '~', where a series of cells add to a known total (such as for ethnicity), and where otherwise the value '#' could be calculated. We have replaced '~' with the total of all pupils minus the total of all other relevant cells, using '#' as 1.5.

For each indicator, such as SEN, we calculated two estimates of how clustered each pupil characteristic is. These estimates are the Gorard segregation index (GS) and the dissimilarity index (D). GS is the exact proportion of potentially disadvantaged pupils, using any indicator, who would have to exchange schools with another pupil for there to no segregation in the national school system. D is the proportion of all

pupils who would have to change schools for there to no segregation in the national school system. The two indices sound and indeed are very similar, and both would be zero if all schools have their proportionate share of potentially disadvantaged pupils.

More formally, GS is:

$$GS = 0.5 * \left(\sum \left| \frac{F_i}{F} - \frac{T_i}{T} \right| \right)$$

Where:
Fi: the number of potentially disadvantaged pupils in school i, where i varies from 1 to the number of schools
Ti: the total number of pupils in school i, where i varies from 1 to the number of schools
F: the total number of potentially disadvantaged pupils in England
T: the total number of pupils in England

Using the same terminology, D is:

$$D = 0.5 * \left(\sum \left| \frac{F_i}{F} - \frac{N_i}{N} \right| \right)$$

Where:
Ni: the total number of non-disadvantaged pupils in school i, where i varies from 1 to the number of schools
N: the total number of non-disadvantaged pupils in England

The indicators F as used here can be:

FSM eligibility (FSMe)
FSM takeup (FSMt)
SEN with a statement (SENs)
SEN without a statement (SENn)
Non-white ethnicity or
Not speaking English as first language.

They yield 12 measures of pupil segregation between schools, six using GS and six using D. For more detail on these calculations, their derivations and relative advantages in analysis, see Gorard et al. (2003).

We track these 12 indicator/index combinations over 14 years from 1996 to 2009, and correlate their trajectories over time using Pearson's R. Where these correlations are 0.98 or higher we treat the pairs of indicator/index combinations as identical. For example, where it is clear that GS and D show the same pattern for any indicator we treat these as the same. We illustrate this in a slightly different way via Principal Component (Factor) Analysis, with Varimax rotation. We also present the change between the first and last years in terms of a standardised 'gap' (Gorard et al. 2001). This gap is the difference between the scores for each year divided by their sum. We also look at the relationships between these results and the frequencies of each indicator over time, and changes in the number of schools and pupils.

As a way of considering the results differently, we also examine the segregation ratios (SR) in terms of each indicator for all secondary schools in 2009. The problem with

area indices such as those presented nationally in this paper (see above) is that they do not indicate which schools over- or under-represent pupils with a certain characteristic. The SR does this. Exley (2009, p. 458) claims that 'the segregation ratio (SR), utilised by Gorard and Fitz (2000a) and Gorard and Taylor (2001), has been unfairly overlooked as an 'evenness' segregation measure'. Using the terminology above, SR equals (Fi/F)/(Ti/T). This yields a score for each school between 0 and around 5 (in practice) with 1 representing a perfectly proportionate national share of pupils with any indicator such as FSM eligibility (Gorard et al. 2003). Again, we calculate Pearson's R as the correlation between SRs for each indicator.

In every analysis described we added a column of figures having the same range and distribution as the genuine data but generated randomly. These random numbers were used in the correlation calculations and factor analyses as a kind of benchmark to help protect against spurious associations. In each example, the random numbers showed a value of R considerably less than 0.05, and were excluded from the factors as having loadings considerably lower than 0.05. We do not present these, but they give us confidence that the patterns and differences we do discuss are robust.

Trends for each indicator

The levels of between-school segregation, in terms of pupil backgrounds from 1996 to 2009, show several different characteristics (Tables 1 and 2). The levels of clustering between schools in terms of different indicators are very different. Segregation by poverty is above 0.3, meaning that around a third of pupils with free school meals would have to exchange schools for poverty to be distributed between schools in proportion to their size. Segregation by pupil special need is a little less than this, but of the same order of magnitude (around 0.28). Segregation by minority ethnic group and for those not speaking English as a first language is around twice these values, however (0.6 or more). Another difference is that segregation by FSM increased from 1996 to 2005/06 and subsequently dropped a little (as reported in Cheng and Gorard 2010). All other indicators, on the other hand, have shown an annual decline in segregation.

Table 1 - Segregation 1996-2002, all indicators, secondary schools in England

	1996	1997	1998	1999	2000	2001	2002
FSM takeup D	0.35	0.34	0.35	0.36	0.37	0.37	0.39
FSM takeup GS	0.30	0.30	0.31	0.32	0.33	0.33	0.34
FSM eligible D	0.38	0.38	0.38	0.39	0.39	0.39	0.39
FSM eligible GS	0.31	0.31	0.32	0.32	0.33	0.33	0.33
SEN statement D	0.30	-	0.28	0.28	0.27	0.27	0.27
SEN statement GS	0.29	-	0.28	0.27	0.27	0.26	0.26
SEN no statement D	0.32	-	0.28	0.26	0.25	0.25	0.27
SEN no statement GS	0.27	-	0.24	0.22	0.21	0.21	0.22
Non-white D	-	0.68	0.67	0.65	0.65	0.64	0.65
Non-white GS	-	0.60	0.60	0.56	0.56	0.55	0.54
Not English D	-	-	-	-	0.70	0.70	-

Not English GS	-	-	-	-	0.65	0.64	-

Note: figures are presented to only two decimal places for ease of reading.
Note: the DCSF figures for SEN in 1997 are only half those of 1996 an 1998, yielding much higher levels of segregation. They cannot be correct, and so we exclude them from our analysis.
Note: DCSF can provide no figures for first language in 2002. Ethnicity was collected from 1997 onwards, and language from 2000 onwards.

Table 2 - Segregation 2003-2009, all indicators, secondary schools in England

	2003	2004	2005	2006	2007	2008	2009
FSM takeup D	0.38	0.38	0.38	0.39	0.39	0.38	0.38
FSM takeup GS	0.34	0.34	0.34	0.35	0.35	0.35	0.34
FSM eligible D	0.39	0.39	0.40	0.39	0.39	0.39	0.39
FSM eligible GS	0.34	0.34	0.34	0.34	0.34	0.34	0.33
SEN statement D	0.26	0.25	0.25	0.24	0.24	0.25	0.25
SEN statement GS	0.25	0.25	0.24	0.24	0.24	0.24	0.24
SEN no statement D	0.28	0.27	0.26	0.26	0.26	0.26	0.26
SEN no statement GS	0.24	0.24	0.23	0.22	0.22	0.22	0.21
Non-white D	0.59	0.57	0.55	0.54	0.54	0.54	0.55
Non-white GS	0.48	0.46	0.45	0.44	0.43	0.43	0.43
Not English D	0.66	0.66	0.66	0.64	0.63	0.63	0.63
Not English GS	0.61	0.60	0.60	0.59	0.56	0.56	0.55

Note: figures are presented to only two decimal places for ease of reading.

So, Tables 1 and 2 seem to suggest that there at least three kinds of segregation. The first is for FSM which shows a different level to ethnicity and language and a different trajectory of change over time to SEN. The second is SEN which shows a very different level of segregation to the third group of ethnicity and language, but a similar trajectory over time.

The differences in the trends over time are clarified in Table 3. While segregation by FSM started at a low level in the period 1996-2009, the highest recorded levels were in 2007 before a slight recent decline. And all four FSM measures show an overall increase from 1996 to 2009. The highest level of segregation in terms of all other indicators occurs in the first year in which each was recorded. And all four – SEN with and without statements, language and ethnicity - show a considerable decrease over time. There is a clear policy explanation for at least part of the decline in SEN segregation, because of the trend over the same period of closing special schools and integrating increasing numbers of special needs pupils in mainstream schools. In addition to this, the absolute number of pupils with special needs both with and without statements in England has risen over the period. The biggest growth has been in non-visible disabilities such as dyslexia (Gorard et al. 2007). For example, in 2006 9.1% of all pupils were classified as SEN without statements and a further 8% had statements. By 2009, 13.5% had SEN without statements and 10.8% with (Maddern 2010). This growth has also contributed to a more even spread of SEN pupils across mainstream secondary schools.

Table 3 – Peak and change 1996-2009, all indicators, secondary schools in England

	Peak year	Peak level	Lowest year	Lowest level	Change 1996-2009
FSM takeup D	2007	0.39	1997	0.34	+4.6%
FSM takeup GS	2007	0.35	1997	0.30	+6.2%
FSM eligible D	2005	0.40	1996	0.38	+1.3%
FSM eligible GS	2007	0.34	1996	0.31	+4.2%
SEN statement D	1996	0.30	2006	0.24	-9.0%
SEN statement GS	1996	0.29	2006	0.24	-9.0%
SEN no statement D	1996	0.32	2001	0.25	-10%
SEN no statement GS	1996	0.27	2001	0.21	-13%
Non-white ethnicity D	1997	0.68	2008	0.54	-11%
Non-white ethnicity GS	1997	0.60	2009	0.43	-17%
Not English first language D	2000	0.70	2009	0.62	-6.0%
Not English first language GS	2000	0.65	2009	0.55	-8.0%

But why has segregation by poverty risen while segregation by ethnicity and language has fallen? Many of the kinds of factors that might affect segregation by poverty, including increased diversity in types of school or school closures, would surely also influence segregation in terms of other pupil characteristics. So are there genuinely different patterns of clustering in schools depending upon the kinds of pupil background measures used, with different determinants? This is the question addressed in the remaining sections of this paper.

Correlation between indicators over time

Table 4 shows the correlation coefficients for all 12 national measures of segregation over time (as in Tables 1 and 2). To two decimal places, several of these 12 measures have correlations at or very near 1, and a very similar pattern of correlation with other indicators. The have been deleted from the columns in Table 4. For example, the pattern for segregation in terms of FSM eligibility is the same whether calculated as the Gorard segregation index or the dissimilarity index. It is also the same for segregation in terms of FSM takeup using the GS. So in Table 4, of these three only the column for GS FSMe is shown. Similarly, segregation in terms of SEN with a statement is the same whether GS or D is used, so only the column for GS is retained. There is no difference between the results for GS and D with ethnicity, nor with language, and so in each case only the column for GS is retained in Table 4. The simplified table makes it easier to see that FSM patterns of segregation are not simply unrelated to segregation by other indicators but actually inversely related in most cells. SEN (no statement) stands out as being unrelated to any other measures, while SEN (with statement), language and ethnicity are all highly cross-correlated.

Table 4 – Correlations between trends in all 12 measures of segregation, secondary schools in England

	FSMe GS	FSMe D	SENs GS	SENn D	SENn GS	Ethnicity GS	Language GS

FSMt D	.97	.79	-.89			-.86	-.78
FSMt GS	.98	.78	-.93			-.89	-.82
FSMe GS		.87	-.95			-.89	-.63
FSMe D	.87					-.51	
SENs D	-.95		1			.98	.84
SENs GS	-.95					.97	.83
SENn D					.96		
SENn GS)				.96			
Ethnicity D	-.87	-.51	.97			.99	.89
Ethnicity GS	-.89	-.51	.97				.92

Note: coefficients with an absolute value less than 0.5 have been suppressed

This is a slight refinement of the pattern of three types of segregation suggested at the outset. There appears to be segregation by poverty (FSM), by non-statemented special need (SEN), and by the other three measures combined.

Correlation between indicators across schools

Another way of looking at the patterns is at school level across all indicators in one year. Table 5 shows the correlation in 2009 for the segregation ratios of all maintained secondary schools in England using all six measures of potential disadvantage (they are assessed in terms of SR rather than GS and D here). In this view, it is statemented SEN that has no substantial relationship to any other form of segregation, and is omitted from the columns in Table 5. As expected the two measures of FSM are again highly correlated, as are segregation by language and ethnicity. And there is some overlap (between 25% and 40%) in segregation by FSM and by language, ethnicity, and SEN without statement, in turn. So, unlike the picture for trends across time, the SRs for schools in 2009 show separate patterns for segregation by FSM, by SEN (with statement), and the other three measures combined. What is constant in variation considered over time and form of analysis is that there are at least three separate patterns of segregation, FSM is separate from SEN, while ethnicity and language are strongly linked.

Table 5 – Correlation between segregation ratios for all 12 indicators, 2009, secondary schools in England

	FSMt	FSMe	SENn	Ethnicity	Language
FSMt		.96	.58	.52	.57
FSMe	.96		.60	.51	.57
SENn	.58	.60			
Ethnicity	.52	.51			.90
Language	.57	.57		.90	

Note: all loadings with an absolute value less than 0.5 have been suppressed
Note: SENs is omitted as showing no substantial correlation with any other variable

Some possible determinants of segregation?

The most parsimonious model from factor analysis explained 93% of the variance in 27 variables, based on only three factors (Table 6). The first factor, general segregation, is strongly related to segregation by FSM. As the number and percentage of FSM pupils rose in the period 1996 to 2009 so the extent to which they were clustered in specific schools declined, and vice versa (correlation -.93). For example, eligibility for free school meals declined from 554061 in 1996 to 409389 in 2008, before rising to 438855 again in 2009. Over the same period, segregation by FSM tended to rise, until the last two years (Cheng and Gorard 2010). The clear finding again is that segregation by ethnicity and statemented SEN runs in the opposite direction to FSM, but is similar in the sense that segregation is always inversely related to overall numbers. Segregation by ethnicity correlates with the number of minority ethnic pupils at -.97.

The second factor, language segregation, links together the four variables related to pupils not having English as first or home language. All have high (absolute) loadings, with the number and percentage of such pupils inversely related to their clustering in schools. As the number of pupils registered as not having English as their first language rose from 259947 (8%) in 2001 to 386575 (12%) in 2009, so the clustering of these pupils in specific schools reduced (correlation of -.99). The percentage (and to a lesser extent the number) of pupils with statements of special needs reduced 1996 to 2009, and this is reflected in high loadings for these variables, reducing in unison with the ongoing desegregation of language groups.

The third factor, SEN segregation, simply links together the four variables related to special needs without statements. None of these four variables is strongly associated with any other measures of segregation or school numbers. All have high (absolute) loadings on factor 3, but they reveal that this segregation is almost entirely a function of the number of such pupils. As the number of pupils in England with special needs rose from 394146 (13%) in 1996 to 622903 (19%) in 2009, so the clustering of these pupils in specific schools reduced (correlation of -.83).

Table 6 – Rotated component matrix, all measures, 1996-2009

Variable	General segregation	Language segregation	SENn segregation
GS index FSMe	-.97		
D index FSMe	-.81		
GS index FSMt	-.97		
D index FSMt	-.96		
GS index ethnicity	.84		
D index ethnicity	.82		
GS index SENs	.84		
D index SENs	.84		
Number of schools	.86		
Number of pupils	-.95		
Pupils per school	-.98		
Number of FSMe	.86		
Number of FSMt	.82		
Percentage of FSMe	.94		

Percentage of FSMt	.93		
Number not white	-.84		
Percentage not white	-.81		
GS index Language		.90	
D index Language		.88	
Number not English		-.88	
Percentage not English		-.89	
Number of SENs		.96	
Percentage SENs		.93	
GS index SENn			.95
D index SENn			.88
Number of SENn			-.92
Percentage SENn			-.91

Note: all loadings with an absolute value less than 0.7 have been suppressed

A further association in Table 6 is that as the number of secondary schools in confirms the pattern from a previous decade (Gorard et al. 2003). At that stage, schools were being closed overall and this appeared to re-distribute existing pupils between the remaining schools more fairly (perhaps because schools with intakes having high levels of poverty were more likely to close). There is some evidence that a similar situation is happening again. There has been a big rise in school closures from 2007 to 2009 (Barker 2010), with more than 1300 primary and secondary now closed in England since 1999. And in the last two years segregation by poverty has reversed trend and started to fall again. Perhaps history is repeating itself.

Conclusion

An important, if minor for the main purpose of this paper, finding is again that the GS and D indices give what are essentially indistinguishable results. In fact, these indices are so similar that their residuals for each school (the absolute values in the formulae above) will always be perfectly correlated (at R=1.0, see Gorard 2009). As summary indices used with real data on all secondary schools in England over 14 years with an unchanged indicator, D and GS again correlate with each other at 1.0 (see Cheng and Gorard 2010). Unless there is substantial change in the prevalence of the indicator used (such as in the change from take-up to eligibility for free school meals, in which case GS is to be preferred), D and GS are both measures of the same thing (a bit like Fahrenheit and Centigrade). See also Gorard (2010b).

The results about the various trends in segregation are not entirely clear cut, since each analysis produces a slightly different model, and the investigation of their potential determinants has only just started. But the answer to the main question in this paper *is* clear. The segregation of pupil characteristics between secondary schools in England 1996 to 2009 is not only one process. At least three distinct kinds of pupil segregation are occurring, using only the limited pupil characteristics available via the ASC. Future papers will show how these few robust characteristics link to the many others, including school attainment, available via the pupil-level annual schools census (PLASC). But this is an important finding in itself, establishing that the sorting and clustering of pupils with different family incomes, languages, ethnic origin, and special needs is a multi-faceted process. It is important because segregation is

important (see above), and because understanding how it occurs is a key part of overcoming its dangers.

In almost every way that the situation is looked at above, the clustering of pupils with special needs but no statement is a separate phenomenon from everything else. Whatever causes it, and causes it to change over time or vary between place, appears to be largely unrelated to what causes segregation by poverty, language and ethnicity. In fact, the trend over time seems to be simple reflection of the growth in the number of pupils deemed to have such special needs. Clustering in schools by ethnicity and first language appears together in most of the models presented above. We can assume, for simplicity at present, that whatever causes segregation by ethnic origin is also related to what causes segregation by language in England. Segregation of pupils from families living in poverty (FSM) is to some extent a separate process from segregation by language/ethnicity, having a very different scale and a near opposite trend over time, and to some extent it is an inverse. Their determinants might be related but in an opposite direction, although this seems an unlikely situation. For example, if selection by aptitude is a process likely to segregate pupils by poverty, it seems unlikely that it would also desegregate them by language/ethnicity (since origin and SES are often strongly related, Van Houtte and Stevens 2010). So, for the present, they will be treated as separate patterns of segregation. Segregation by poverty is less, for the same or similar number of pupils, when there are fewer schools. Segregation by special needs with statements, shares some of the characteristics of segregation by poverty (such as a similar scale), some similarities with segregation by language/ethnicity (such as a decrease 1996 to 2009), and a very few similarities with non-statemented special needs. Surprisingly, it is the one trend that cannot be explained, even in part, by changes in the number of pupils with special needs.

Given that these analyses suggest at least three different processes of segregation in the secondary schools of England, our next step is to understand the determinants and impacts of each process more fully. For that, we are performing analyses at local authority and school levels, and conducting in-depth fieldwork in a selection of authorities and schools chosen to represent the varieties of patterns of segregation of each kind.

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